SNOWY PLOVER (*Charadrius alexandrinus*) (Interior Population)

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Criteria Scores

Population Trend	Range Trend	Population Size	Range Size	Endemism	Population Concentration	Threats
10	5	7.5	10	0	5	10

Special Concern Priority

Currently considered a Bird Species of Special Concern (breeding), Priority 3. Included on the original prioritized list (Remsen 1978) and CDFG's (1992) unprioritized list.

Breeding Bird Survey Statistics for California

Data inadequate for trend assessment (Sauer et al. 2000).

General Range and Abundance

The Snowy Plover (*Charadrius alexandrinus nivosus*) is one of at least five subspecies of *C. alexandrinus* found on four continents outside of North America. US range extends along the Pacific and Gulf Coasts, and in patchy locations in the Great Basin, the Great Plains, and the southwest. In US there are an estimated 21,000 individuals. The interior Snowy Plover is one of three distinct N. American populations that include Gulf Coast and Pacific Coast (federally threatened). Interior California breeding range extends from the borders of Nevada and Arizona to the Central Valley, and from the border of Oregon to the Salton Sea in southern California (Page et al. 1995).

Seasonal Status in California

Occurs as migrant, summer, and year-round resident; breeding season extends from March to September.

Historical Range and Abundance in California

Little documentation exists about the interior Snowy Plover's breeding range before 1970s (Page et al. 1995). The following are known historic breeding locations summarized in Grinnell and Miller (1944): Goose Lake, Modoc Co.; Los Banos, Merced Co.; Tulare Lake, Kings Co.; Firebaugh, Fresno Co.; Buena Vista Lake, Kern Co.; Owens Lake, Inyo Co.; Lake Elsinore, Riverside Co.; Salton Sea, Imperial Co. Page et al. (1995) noted that the destruction of densely populated interior lakes in s. San Joaquin Valley in the 1800s likely caused the breeding range to shrink.

Recent Range and Abundance in California

Accurately assessing the plover breeding population is a challenge for even skilled observers because many birds remain cryptic while incubating a nest on expansive alkali surfaces. Based on known banded birds at Mono Lake, for example, detection rates for plovers ranged from 1 male observed: 1.6 unobserved to 1 female observed: 3 unobserved (Warriner et al. 1986). Nonetheless, there have been two comprehensive statewide surveys conducted during the breeding season. Covering more sites than the first statewide survey in 1978, a more recent survey of interior breeding sites, conducted in 1988, documented 1745 plovers (Page and Stenzel 1981, Page et al. 1991). Despite covering more sites, the 1988 survey found about 100 less adults than in 1978.

Northern California. 1988 surveys of Lower Alkali, Middle Alkali, and Upper Alkali Lakes, Modoc Co estimated that these sites collectively supported 28% of the state population (494 birds) (Page et al. 1991). The breeding population at the Alkali Lakes increased by 136 between the two surveys. Page et al. (1991) estimated small numbers breeding documented at Goose Lake, Modoc Co. (33 in 1978 and 4 in 1988). Once considered a rare migrant at Lower Klamath Wildlife Refuge, Siskiyou Co. nesting was first recorded in 1957; however, no nests were recorded again until 1996 (D. Shuford in litt.). Page and Stenzel (1981) documented 11% of state's breeding population at Honey Lake, Lassen Co. In the southern Sacramento Valley, there have been 6 records of nesting in Yolo and Sutter Cos. (Sidney 1998).

San Joaquin Valley. With the loss of extensive dry lakes, breeding and wintering plovers presently utilize evaporation and sewage ponds in the Valley. The 1988 survey covered more area, and found more suitable habitat and over a fivefold increase in plovers in the Valley compared to 1978 (Page et al. 1991). The authors estimated 252 adults in 1988 (14% of state) and only 45 in 1978 (2% of state). Roster et al. (1992) estimated 181 breeders at evaporation ponds in north-central Kern, southeastern Kings, and southwestern Tulare Cos. during 1988 surveys. At four of the larger evaporation ponds, surveyed from 1994-2001 between May 11-Jun 3, numbers of adults fluctuated about a mean of 26 (17 in 1994; 28 in 1995; 19 in 1996; 35 in 1997; 40 in 1998; 9 in 1999; 5 in 2000; 58 in 2001) (R. Hanson unpubl. data). Estimated cumulative hatching success between 1994-2001 at these sites is low (7%) compared to that measured in 1987 (Roster et al. 1992). Surveys conducted from 1993 to 2000 in late May at three sites at Westlake Farms, Fresno Co. found decreasing numbers of plovers (101 in 1993; 42 in 1994; 18 in 1995; 12 in 1996; 13 in 1997; 13 in 1998; 3 in 1999; 6 in 2000) (J. Seary in litt.).

Eastern Sierra Nevada. A conservative estimate of breeding population for eastern half of Owens Lake in 2001, based on the maximum number of concurrent nests, was 102 birds (Ruhlen and Page 2001). Window surveys conducted in late May 2001 of the western side of Owens Lake estimated 58 adults (Page 2001). Because of the difficulty in surveying the entire lake, it is very likely that over 160 plovers currently breed at Owens Lake; thus, bringing the population close to what it was estimated to be in 1988 (195 adults) (Page et al. 1991). Yet these numbers suggest that the number of breeders has dropped since 1978, when 499 adults (27% of state population) were documented. It is also possible that 1978 was an extraordinary year. Page and Stenzel (1981) recorded 384 adults at Mono Lake (21% of state). In late May 2001, a survey at Mono Lake estimated 119 adults, marking a decrease in breeders from 342 in 1988 and 384 in 1978 (Page et al. 1991). This suggests a reduction by over two third numbers of breeding adults since the previous lake-wide survey in 1978. Possible explanations for reduced numbers include habitat loss caused

by increasing water levels in Mono Lake, and/or unfavorable windy conditions during the 2001 survey. Plovers nest in small numbers on Crowley Lake and scattered alkali lakes, Mono Co.; these breeding sites, between 6500' and 6900', are among the highest elevation sites in the state (Shuford and Metropolus 1996).

Southern California. Thorough surveys of the Salton Sea, Imperial and Riverside Cos. indicate that the numbers of breeders have remained quite stable: 226 in 1978 (12% state) to 198 in 1988 (11% state), and 221 in 1999 (Page and Stenzel 1981, Page et al. 1991, Shuford et al. 2000). In 1978, 61 adults recorded at Harper Dry Lake and 16 at Searles Lake, San Bernadino. Breeding likely occurred at Harper Dry Lake in 2001 (W. Wehtje pers comm.).

Ecological Requirements

Summarized by Page et al. (1995) unless otherwise noted. The interior population of Snowy Plovers breed on barren to sparsely vegetated flats, along shores of alkaline and saline lakes, reservoirs, ponds, braided river channels, agricultural wastewater ponds and salt evaporation ponds.

Breeding phenology is largely a function of the onset of spring and, thus, varies geographically. In southern deserts, clutch initiation can be in early March. At sites in the southern San Joaquin Valley, egg laying began in late March (Roster et al 1992). Egg laying at Great Basin sites, which usually have the latest onset of breeding, commences by about the third week of April. In 2002, a plover brood was found at Owens Lake in early April, suggesting that clutch initiation in the Eastern Sierra Nevada can begin in the first week of March (T. Ruhlen pers. comm.). Clutch initiation ceases at all sites by mid-July. Fledging, or first flight, occurs between 28-33 days after hatch. Most broods have fledged by September.

Plovers can nest and raise broods where a small seep is their only source of water; nesting has not been confirmed in locations without water. Adults and broods typically forage near shallow water (1-2 cm deep) - sometimes up to 4 km from their nests - and on dry flats. Nest distance to water ranges from 1m to 3 km (Henderson and Page 1981). Plovers will move broods long

distances to feed. Terrestrial and aquatic invertebrates, including flies, beetles, hemiterans and brine shrimp, are the main prey items of interior plovers.

Henderson and Page (1981) found that the major nesting habitats at California interior lakes were non-vegetated and sparsely vegetated flats, and 40% of nests were partially concealed by objects within 15 cm of the nest such as a stick, rock or clump of vegetation. Similarly at Owens Lake, no nests were found in dense vegetation, most nests were found on barren alkali or near sand washes, about one third of nests were near objects such as rocks, logs or sparse vegetation, and one fifth were in or near vehicle tracks (Ruhlen and Page 2001). At San Joaquin Valley agricultural drainwater impoundments, nests were found on salt crust or hard clay surfaces of levees, spits and islands. Over 60% of nests had no plant cover, and no nests were found where plant cover was greater than 75% (Barnum et al. 1992).

Threats

Habitat management and changes in water levels, natural and human induced, may pose the greatest potential threat to interior nesting Snowy Plovers. Interior alkaline and saline lakes are subject to a high degree of natural seasonal and annual water level and salinity fluctuations, and local avifauna must disperse when conditions are no longer favorable (Jehl 1994). The health of a population depends on the availability of back-up sites that can be used when conditions change.

Human-induced change to water levels during the breeding season can impact nesting success. At the Lancaster Sewage Ponds and Piute Ponds on Edwards Air Force Base, Kern Co. water levels between ponds fluctuate from totally dry to extremely high water levels causing problems for nesting plovers (Kathy Molina pers. comm.). As part of an ongoing dust mitigation project at Owens Lake, experimental shallow flooding showed an increase usage by Snowy Plovers, but problems with nest inundation due to either fluctuating water levels or wind blown surface water (Hudson and Page 2000). Dense vegetation will be planted on the lakebed to help reduce dust emissions, resulting in the loss of suitable nesting habitat; however, shallow flood areas elsewhere

on the lakebed will be created to try and offset habitat losses. The effects to the local population will be studied, but are unknown at this time.

Elevated levels of heavy metals and trace elements may affect plovers at agricultural wastewater impoundments (Barnum 1992). High concentrations of selenium associated with evaporation ponds may reach toxic levels that have been shown to impact other waterbirds (Ohlendorf et al. 1986).

Large restoration projects have been proposed to reduce salinity and some may impact nesting habitat if placed in shallow water or alkali flat habitat that currently exists (Shuford and Warnock 1999). Avifauna at the Salton Sea may also be exposed to contaminants due to the agricultural and industrial run off, however effects on nesting and wintering Snowy Plovers is unknown as contaminant analysis have not been conducted. Other species of shorebird have died at the Salton Sea due to botulism and avian cholera outbreaks (Shuford et al. 1999). Floodwaters from summer monsoons on the western side of the Salton Sea negatively impact nesting plovers (Kathy Molina pers comm.).

The levels and impacts of recreation remain largely undocumented for interior sites. There are some areas of the Salton Sea that are heavily used by people, including off-road vehicles, which may impact plovers (Henderson and Page 1981, Kathy Molina pers. comm.). Most alkali lakes are not yet subject to the heavy development and recreational activities that are a current threat to coastal habitat used by the Pacific Coast population. Recreational disturbance may impact interior plovers that winter on Pacific Coast beaches (Lafferty 2001).

Few studies of Snowy Plover breeding success have been conducted in the interior region of California, and productivity levels may vary annually; therefore, the effect of predation on interior nesting plovers is largely unknown. At Mono Lake, low nesting density increased nest success, as predators more easily locate clumped nests (Page et al 1983).Potential predators of Snowy Plovers, and their nests and chicks include: Common Raven (*Corvus corax*), American Crow (Corvus

brachyrhynchos), California Gull (*Larus californicus*), American Kestrel (*Falco sparvarius*), Prairie Falcon (*Falco mexicanus*), Peregrine Falcon (*F. peregrinus*), Merlin (*F. columbaricus*), Northern Harriers (*Circus cyaneus*), Loggerhead Shrike (*Lanius ludovicianus*), Coyote (*Canis latrans*), Racoon (*Procyon lotor*), and Bobcat (*Lynx rufus*) (Henderson and Page 1981).

Management and Research Recommendations

- Conduct research on population trends and productivity rates of the Snowy Plover in the interior of California to identify management and protection needs.
- Focus on protecting and enhancing important breeding areas through the determination of source areas for the overall population.
- Intensively monitor annual productivity at locations where water management changes are proposed or enacted. Protect, enhance and/or restore habitats that may be negatively impacted or threatened by water management practices.
- In areas where high levels of predation may be limiting the productivity of a local population, conduct predator surveys to identify predator management needs.
- Assess the impact of human recreation at breeding and wintering sites.
- Some areas may be improved by clearing non-native vegetation, such as salt cedar (*Tamarix gallica*), that limits nesting habitat.
- Identify and protect key stopover and wintering areas for Snowy Plovers, such as the Salton Sea, San Joaquin Valley evaporation ponds and coastal beaches.
- Assess the impact of environmental toxins to plovers at sites where dangerous concentrations have been measured.

Monitoring Needs

- Systematic ongoing monitoring using consistent methods and survey routes. The Breeding Bird Survey is inadequate for monitoring changes in the population dynamics of Snowy Plovers.

- Window breeding surveys may be appropriate where resources are limited and should take place between May 24 and June 7. Surveys should be repeated at least every 3-5 years at all locations with suitable nesting habitat, and annually at areas with larger populations. Since males are easier to detect than females during the nesting period, correction may be needed for window surveys.
- Surveys should provide maximum coverage with the least possible disturbance to Snowy Plovers and other taxa. Avoid disturbing plovers during the heat of the day. Early morning surveys or, in some areas, dusk seep watches may increase detection of plovers and their broods.
- Where resources are available, measure annual productivity in terms of clutch-hatching rates. Collect data on the age and sex of plovers, number of nests, nest loss dates and causes of loss, and the number and relative size of chicks.
- Where possible, determine population viability in terms of number of chicks fledged per male. Color-banding of broods may be necessary to achieve this level of monitoring.
- Monitor levels of environmental contaminants in areas of concern by collecting and testing salvaged eggs. Eggs should be analyzed for organochloride compounds, total polychlorinated biphenyls (PCB's), selenium, mercury and boron.

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